Repeated Multiplication

→ **If** $\frac{a}{b} \in$ **Q, n** $\in$ **Z**$^+$ **then** $(\frac{a}{b})^n = \underbrace{\frac{a}{b} \times \frac{a}{b} \times \frac{a}{b} \times \ldots\ldots \times \frac{a}{b}}_{n-\text{times}}$

n – times

$(\frac{a}{b})^n$ = is read as ($\frac{a}{b}$ **power n)**

→ **Keep in your mind that:**

$(\frac{a}{b})^n = \frac{a^n}{b^n}$

$(\frac{a}{b})^0 = 1$ where $a \neq$ zero, $b \neq$ zero.

$(\frac{a}{b})^1 = \frac{a}{b}$

$(\frac{-a}{b})^n = (\frac{a}{b})^n$ **If n is even number.**

$(\frac{-a}{b})^n = -(\frac{a}{b})^n$ **If n is odd number.**

Generally:

$$(\frac{-a}{b})^n \begin{cases} \text{If n even} \rightarrow +ve \\ \text{If n odd} \rightarrow -ve \end{cases}$$

Non – negative integer powers

Rule: If $\frac{a}{b}$ is a rational number n , m $\in$ Z$^+$ then

1) $(\frac{a}{b})^n \times (\frac{a}{b})^m = (\frac{a}{b})^{n+m}$

2) $(\frac{a}{b})^n \div (\frac{a}{b})^m = (\frac{a}{b})^{n-m}$

3) $\left(\left(\frac{a}{b}\right)^{n}\right)^{m} = \left(\frac{a}{b}\right)^{n \times m}$

→ If $\frac{a}{b}$ is a rational number, m, n $\in Z^{+}$ then

$$\left(\frac{a}{b}\right)^{n} \times \left(\frac{a}{b}\right)^{m} = \left(\frac{a}{b}\right)^{n+m}$$

→ If $\frac{a}{b}$ is a rational number, n,m $\in Z^{+}$, then

$$\left(\left(\frac{a}{b}\right)^{n}\right)^{m} = \left(\frac{a}{b}\right)^{n X m}$$

Negative integers Powers

If a $\in$ Q , a $\neq$ o , n $\in Z^{+}$ then

$a^{-n} = \frac{1}{a^{n}}$ **and** $\frac{1}{a^{-n}} = a^{n}$

$a^{n} \times a^{-n} = a^{n-n} = 1$

a^{-n} is the multiplicative inverse of a^{n}.

Standard scientific notation

Scientific notation:

Is a method to express numbers that so large or so small that are difficult to read or to write and

Scientific notation makes it easier to read, write and calculate the values.

To express a number in a standard scientific notation, write it in this form of

$a \times 10^{n}$ $1 \leq |a| < 10$ and $n \in z$

Order of mathematical operations

D.M.S

D → Division
M → Multiplication
S → Sum **or** Subtraction

1) $3 + \mathbf{(}5 + 2\,(8 \div 4)\mathbf{)}$

$3 + \mathbf{(}5 + 2\,(2)\mathbf{)}$

$3 + (5+4) = 12$

2) $144 - 8 \div 2^3 = 144 - 8 \div 8 = 143$

The square root of a rational number

a) $\sqrt{400} = \sqrt{(20)^2} = \pm 20$

b) $\sqrt{\frac{9}{25}} = \sqrt{(\frac{3}{5})^2} = \pm \frac{3}{5}$

Solving Equations

*Equation of first degree with the same solution are called Equivalent equations

***Rule**:

If a, b and c are rational numbers.

1)If a = b then $a \pm c = b \pm c$
And $a \times c = b \times c$

2)If a + c = b + c then a = b

3)If $a \times c = b \times c$, $c \neq$ zero then $a = b$

Inequalities

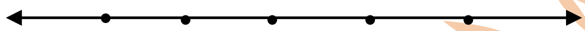
If $x \leq 3$ called an inequality, x is variable.

All what we know about x that its less than or equal 3

Then the set of values which satisfy the inequality is

$$\{3, 2, 1, 0, -1, -2, \ldots\ldots\ldots\}$$

And can be represented on the number line.



Solving inequalities

The solution set is the set which its elements satisfy the inequality

It's a subset of the substitution set

If $a > b$, $c > 0$

Then 1) $a+c > b+c$

2) $ac > bc$

If $a > b$, $c < 0$ (negative)

Then $ac < bc$

Notes:

1) *Adding or subtracting the same number to each side of any inequality gives an equivalent inequality & it doesn't change the value of the variable.*

2) *Multiplying or dividing each side of any inequality by the same positive number doesn't change the direction of the inequality.*

3) *Multiplying or dividing each side of any inequality by a negative number, however, reverse the direction of the inequality.*

Probability

Experimental probabilities=

$$\frac{\text{No. of trials in which the out come occurs}}{\text{Total number of trials}}$$

Questions

Exercise (1)

(1) Complete:

1) $-3\,ab^2 \times 2a^2b^3 =$ ……………

2) $3 \times 4 - 21 \div 7 =$ ……………

3) $\sqrt{9 + 16} =$ ……………

4) The additive inverse of $\left(\frac{-2}{3}\right)^3$ is ……………

(2) Choose the correct answer:

1) 7.35×10^{-4} equals:

a) 0.000735　　b) 0.00735　　c) 0.0735　　d) 7350

2) $\sqrt{\left(-\frac{2}{3}\right)^2}$ equals:

a) $\frac{-4}{9}$　　b) $\frac{-2}{3}$　　c) $\frac{2}{3}$　　d) $\frac{4}{9}$

3) $3^{10} + 3^{10} + 3^{10}$ equals:

a) 3^{10}　　b) 3^{11}　　c) 3^{20}　　d) 3^{30}

4) The age of Amer now is x years then his age 5 years ago is …..

a) 5x　　b) 5 + x　　c) 5 – x　　d) x – 5

(3)

a) Find the value of the following expression in simplest form: $\frac{5^{-2} \times 5^5}{5^3}$

b) If $300000 = 3 \times 10^x$ find the value of x.

c) Find the solution set of the following inequality in $\mathbb{Q}$: $4x + 7 \leq 3$

d) Three even consecutive numbers its sum is 204. Find these numbers.

Exercise (2)

(1) Complete:

1) $\sqrt{100-64}$ = ...

2) If x + 9 = 11 , then 7x = ...

3) If we subtract twice the number x from 3 then the results is ......

4) if $x = \frac{1}{4}$, $y = \frac{1}{8}$, then $(x - y)^{-1}$ = ...

(2) Choose the correct answer:

1) $2^4 \times 3^4$ = ...

a) 5^4 b) 6^4 c) 6^8 d) 6^{16}

2) If x = 0.0009 then $\sqrt{x}$ equals ....

a) 0.0003 b) 0.0081 c) 0.003 d) 0.03

3) Which of the following is the smallest number:

a) 314×10^3 b) 3.14×10^4 c) 31.4×10^5 d) 0.314×10^6

4) If $-x < 3$ then:

a) $x > 3$ b) $x > -3$ c) $x < 3$ d) $x < -3$

5) Quarter of 4^{20} equals ....

a) 4^5 b) 4^{10} c) 4^{19} d) 2^{10}

(3)

a) Put the expression $\left(\frac{1}{2}\right)^2 \times \left(-\frac{1}{2}\right)^3$ in the simplest form.

b) If $x = \frac{-1}{2}$, $y = \frac{3}{4}$ find the numerical value of the expression $\left(\frac{y}{x^2}\right)^{-2}$ in the simplest form.

c) Find in Z the s.s of the inequality $3 - 2x \geq 1$, then represent it in the number line.

d) The length of a rectangle is twice its width, if the length decreases by 5 cm and the width increases by 6 cm, the rectangle becomes a square. Find the area of the rectangle.

Exercise (3)

(1) Complete:

1) The standard form of the number 0.00003 = ……………

2) $\sqrt{10^2 - 6^2}$ = ……………

3) The s.s of the equation: 3x + 7 = 5 , $x \in \mathbb{Q}$ is …………

4) If: ac > bc , then a …….. b (where c < 0)

(2) Choose the correct answer:

1) $2^7 \times 3^7$ equal: ……………

a) 5^7 b) 6^7 c) 6^{14} d) 6^{49}

2) If a = b then $\left(\frac{3}{7}\right)^{b-a}$ equals ……………

a) zero b) 1 c) $\frac{3}{7}$ d) $\frac{7}{3}$

3) $\frac{4a^2b^4}{2a^3b^3}$ equals …………

a) 2 ab b) $2a^5b^7$ c) $\frac{2b}{a}$ d) $\frac{2}{ab}$

(3)

a) Find the s.s of the inequality in $\mathbb{Q}$: $1 < x - 3 \leq 6$

b) A man's age now is three times his son's age, and after two years, the sum of their ages will be 52 years, what the age of each now?

c) Put the following expression in simplest form: $\frac{7^{-3} \times 7^5}{7^2}$

d) If $x = \frac{-3}{2}$, $y = \frac{-4}{3}$ find in simplest form $\left(\frac{x}{y}\right)^2$

Statistic

Exercise (1)

(1) Complete:

1) The probability of the certain event = ...

2) If a coin is tossed once then the probability of appearance of a head = ...

3) A card is chosen randomly from a group of cards labeled by the letters of word "Mansora" then the probability that the drawn card carries the letter "S" is ....

(2) Choose the correct answer:

1) If the probability that a pupil succeed is 75% then the probability of his failure is ....

a) - 0.25 b) 0.25 c) 0.75 d) 1.25

2) If a die is thrown once and observed the upper face then the probability of appearance a number divisible by 3 = ...

a) $\frac{1}{4}$ b) $\frac{1}{3}$ c) $\frac{1}{2}$ d) $\frac{3}{4}$

3) A card is drawn randomly from 10 cards numbered from 1 to 10, then the probability of drawing card carries number odd and greater than 3 is ....

a) $\frac{3}{10}$ b) $\frac{4}{10}$ c) $\frac{5}{10}$ d) $\frac{7}{10}$

(3)

a) If the probability that a pupil succeed in a subject is 0.85. Find the probability of his failure in the same subject.

b) A bowl contains a number of similar colored balls 2 of them are green, 4 are blue and the rest are red, if the probability of drawing a green ball at random is $\frac{1}{6}$. Find the number of red balls.

c) The set {2 , 3 , 5} is used in writing a number contains of two digits:

* First: Write the sample space.

* Second: Find the probability of the following events:

i) The sum of the two digits are 12

ii) Both of the two digits are equal.

Exercise (2)

(1) Complete:

1) The probability of the impossible event = ……………

2) If a die is thrown once then the probability of appearance number 3 on the upper face = ……………

3) If a digits is chosen at random from the number 37450 then the probability that the chosen digit is even = ……………..

(2) Choose the correct answer:

1) Which of the following may be the probability of an event?

a) - 0.35 b) 98% c) 102% d) 1.13

2) In an experiment of throwing a regular die once, the probability of appearance a number greater or equal 6 is ……………..

a) zero b) $\frac{1}{6}$ c) $\frac{5}{6}$ d) 1

3) A basket contains 48 of similar balls, some of them are white, red and the rest are green, if the probability that the chosen ball is red is $\frac{5}{8}$, then the number of red balls is ……………..

a) 24 b) 30 c) 32 d) 36

(3)

a) A bag contains 15 cards labeled from 1 to 15, a card is drawn randomly. Find the probability that the drown card carries even number greater than 7.

b) If a regular die is thrown once, what is the probability of the following events:

* First: appearance number divisible 7.
* Second: appearance prime number less or equal 5.

c) A card is drawn randomly from 8 cards are numbered from 1 to 8. Find the probability of the following events:

i) Getting even number greater or equal 4.

ii) Getting a prime number.

Exercise (3)

(1) Complete:

1) The probability of any event not less than …………… and not more than …………….

2) When thrown a die once, then the probability of getting an odd number on the upper face = ……………

3) If the probability that the pupil succeeds is 0.85 then the probability of his failure is ……………

(2) Choose the correct answer:

1) When tossing a coin 200 times then the expected of the approximating number of appearance of a head equals …………

a) 96 b) 106 c) 199 d) 201

2) The number of pupils in a class is 32 pupils in a school of 320 pupils, if a pupil is selected randomly what is the probability that the pupil from this class?

a) $\frac{1}{8}$ b) $\frac{1}{4}$ c) $\frac{1}{5}$ d) $\frac{1}{10}$

3) When a die is tossed twice and observed the upper face in each time then the probability of appearance number 5 in the two tosses is ………….

a) $\frac{1}{36}$ b) $\frac{5}{36}$ c) $\frac{6}{36}$ d) $\frac{25}{36}$

(3)

a) A bowl contains 6 red balls, 10 black and 4 white balls, a ball is drawn randomly find the probability of the ball is not red.

b) A box contains 15 cards numbered from 1 to 15, a card is drawn at random. Find the probability that the drawn card carries even number divisible by 3.

c) The set { 2 , 3 , 5} is used in writing a 2-different digit number. Find the probability of the following events:

* First: The unit digit is even.
* Second: The sum of the two digits greater than 5.

Model (1)

(1) Complete:

1) $2 \times 6 - 4 \div 2 =$ ……………

2) If $7 - 2x = 3$, then $x =$ ……………..

3) If $3x + 1 \geq 10$, then $x \geq$ …………….

4) The standard form of the number $0.7 \times 0.005 =$ ……………

5) A class has 36 students, the number of boys are 20, if a student is chosen randomly, then the probability that the student is a girl = …………

(2) Choose the correct answer:

1) The sum of the probabilities for all possible outcomes of a randomly experiment is ………..

a) zero b) 1 c) > 1 d) < 1

2) If $3a = \sqrt{4}\,b$, then $\frac{a}{b} =$ ……………

a) 2 : 3 b) 3 : 2 c) 3 : 4 d) 4 : 3

3) $\left(\frac{-2}{3}\right)^{-3}$ equals ……………

a) $\frac{-27}{8}$ b) $\frac{-8}{27}$ c) $\frac{8}{27}$ d) $\frac{27}{8}$

4) There are 21 boys and 15 girls in a classroom, one pupil is chosen randomly, the probability that the chosen pupil is a girls = ………

a) $\frac{5}{12}$ b) $\frac{7}{12}$ c) $\frac{4}{7}$ d) $\frac{5}{6}$

5) $\sqrt{(-8)^2 + (-6)^2} =$ … … … … . .

a) | - 10 | b) ± 10 c) 14 d) - 14

(3) Simplify to the simplest form:

a) $\left(-\frac{3}{7}\right)^0 \times \left(\frac{-2}{5}\right)^2 \times \sqrt{6\frac{1}{4}}$

b) Find the numerical value of the expression

$3ab + 8a \div 4b$ when $a = 4$, $b = -2$

(4) Simplify to the simplest form:

a) Find in $\mathbb{Q}$ the s.s of the following:

First: $3x + 1 = 25$ Second: $2x + 5 < 16$

b) The population of a city has been growing according to the rule:

$y = 3\,(1.02)^n$ million. Calculate the population that will be in 2 years in the standard form.

(5) A factory of a tire record the distance that traveled by a certain type of then before damage for 800 units of this type as following:

The distance in thousand km	Less than 50	50 to 100	More than 100 till 150	More than 150
The number of damage tire	80	120	280	320

If you bought the type of this tyre, what is the probability of change it:

- First: before traveled 50 thousand km.
- Second: After traveled more than 100 thousand km.

Model (2)

(1) Complete:

1) $\left(\frac{-2}{3}\right)^0$ = ……………

2) $\sqrt{\frac{16}{49}}$ = ……………

3) The probability of impossible event = ……………

4) Complete in the same pattern 1, 2, 3, 5, 8, ……., ………

5) If the probability that the student is absent in a school is 0.15, if the number of students of this school is 600, then the number of the present student that day is ………..

(2) Choose the correct answer:

1) $2^3 \times 2^5$ = ……………

a) 2^2 b) 2^8 c) 2^{15} d) 2^{53}

2) Which of the following the greatest:

a) 2.3×10^4 b) 2.3×10^5 c) 3.2×10^4 d) 3.2×10^5

3) The side length of a square whose area $9x^2$ cm^2 is …………

a) 3x b) $3x^2$ c) 9x d) $9x^2$

4) Which of the following may be probability of an event:

a) - 0.25 b) 87% c) 1.05 d) 130%

5) If - x > 4, then :

a) x > - 4 b) x > 4 c) x < - 4 d) x < 4

(3)

a) Two integers number the smaller one is 2x and the greater is 5x, if the difference between them is 30 find the two numbers.

b) Find the value of $\frac{5^{-4} \times 5^{7}}{5^{3}}$ in the simplest form.

(4)

a) Find in $\mathbb{Q}$ the s.s of each of the following:

i) $(3x + 2) + 5 = 13$ ii) $2x + 15 < 19$

b) Find the value of the expression in the simplest form:

$$\left(\frac{-1}{3}\right)^{2} + \sqrt{\frac{64}{81}} - \left(\frac{3}{7}\right)^{0}$$

(5)

a) If a regular die is thrown once and observed the number on upper face, find the probability of each of the following:

i) getting prime even number.

ii) getting odd number less than 4.

b) If the length of a rectangle is twice its width, its area is 12.5 cm^2. Calculate its length, its width.

Model (3)

(1) Complete:

1) The probability of the certain event = ...

2) $\frac{1}{9}$, $\frac{1}{8}$, $\frac{1}{7}$, $\frac{1}{6}$, ... , ... (in the same pattern)

3) The s.s in $\mathbb{Q}$ for the equation 2x + 3 = 4 is ....

4) If $x = \frac{1}{2}$, $y = \frac{1}{4}$, then $(x + y)^{-1}$ = ...

5) $0.00037 = 3.7 \times 10^n$, the value of n = ...

(2) Choose the correct answer:

1) The multiplicative inverse of the number: $\sqrt{\frac{9}{16}}$ is ....

a) $\frac{-4}{3}$ b) $\frac{-3}{4}$ c) $\frac{3}{4}$ d) $\frac{4}{3}$

2) $\frac{x}{2}$ < 5 equivalent ....

a) $x < \frac{5}{2}$ b) $x > \frac{5}{2}$ c) x < 10 d) x > 10

3) $3^x + 3^x + 3^x$ equals:

a) 3^x b) 3^{x+1} c) 27^x d) $3x^3$

4) There are 480 pupils in a school, 120 of them failed. A pupil is chosen at random, then the probability that the pupil is succeeded ....

a) 0.25% b) 0.75 c) 0.8 d) 0.667

5) If x = y , then $\left(\frac{3}{5}\right)^{x-y}$ = ...

a) 0 b) 1 c) $\frac{3}{5}$ d) $\frac{5}{3}$

(3)

a) What is the number which if we add it to its three times, the result is 28.

b) If the area of a square equals the area of a triangle whose base length is 9 cm, its height is 8 cm. Find the side length of the square.

(4)

a) Find in $\mathbb{Q}$ the solution set of the following:

i) $3x + 5 = 11$ ii) $2x + 3 \leq 7$

b) If the distance (S) between the sun and the earth is 1.44×10^8 km and the light velocity (V) is 3×10^8 m/sec. Calculate the elapsed time (t) that the light takes to reach from the sun to the earth given that ($S = V \times t$)

(5)

a) Find the result of the expression: $(5.4 \times 10^4) + (3.7 \times 10^5)$ in the form $a \times 10^n$ where n is integer number.

b) A coin is tossed twice calculate the probability:

i) the two faces are similar.

ii) appearance only one tail.

Model (4)

(1) Complete:

1) When a coin is tossed once the probability of appearance of a head is ……………..

2) $\frac{1}{1000}$, $\frac{1}{100}$, $\frac{1}{10}$, ………………… (in the same pattern)

3) The s.s of the inequality 2 < x ≤ 4 in ℕ is …………

4) The additive inerfe of $\sqrt{\left(-\frac{2}{5}\right)^2}$ is ……………

5) $\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{15}{16}$, ……… , ………

(2) Choose the correct answer:

1) The s.s of the equation: x + 3 = 3 in ℕ is ……………

a) ∅ b) { 0 } c) { 3 } d) { 6 }

2) The number which in the standard form between the following numbers is …………

a) 11×10^{8} b) 9.7×10^{-5} c) 10.3×10^{-3} d) 0.87×10^{8}

3) If a coin is tossed 160 times then the approximate expected number of the appearance of a head is …………

a) 60 b) 78 c) 90 d) 159

4) The number $\sqrt{0.09}$ is …………

a) natural b) positive integer

c) negative integer d) rational

5) If : $\frac{6x}{5}$ = -2 , then x^2 = …………

a) $\frac{-25}{9}$ b) $\frac{5}{9}$ c) $\frac{25}{9}$ d) $\frac{25}{3}$

(3)

a) If $x = \frac{3}{4}$, $y = \frac{-3}{2}$ find the numerical value of the expression $\left(\frac{x^2}{y^3}\right)^2$

b) The sum of two natural number is 15 and the difference between them is 5. Find the two number.

(4)

a) Find in $\mathbb{Q}$ the solution set for each of the following:

First: $3x + 2 = 8$ Second: $4x$

b) If $\frac{3}{4}$ of the area of a square is $1\frac{11}{64}$ m^2. Find its side length.

(5)

a) A coin is tossed twice calculate the probabilities:

* First: the appearance of at least one head.

* Second: the appearance of at most one head.

b) Find the value of $\left(\frac{7^4 \times 7^{-2}}{7^3}\right)^{-2}$

Model (5)

(1) Complete:

1) In the experiment of tossing a die one then the probability of appearance even number is …………..

2) If $\frac{x}{y} = \frac{7}{2}$, then $\frac{2x}{7y}$ = ………… = …………..

3) If a = 0.000625 , then $\sqrt{a} = 2.5 \times 10^{\cdots\cdots}$

4) The result of the expression: $\left(\frac{-1}{2}\right)^2 - \left(\frac{-1}{2}\right)^3$ is …………..

5) Quarter of 4^{20} equals …………..

(2) Choose the correct answer:

1) The s.s of the inequality x < 2 in ℕ is …………

a) { 0 } b) { 1 } c) { 0 , 1} d) ∅

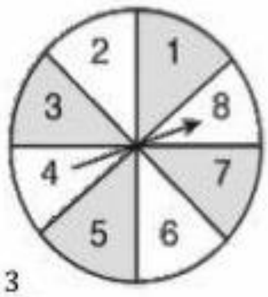
2) If $\frac{26}{x} + 1 = 14$, then x equals ………..

a) 2 b) 10 c) 13 d) 20

3) If 5x = 35 , then 2x + 1 equals …….

a) 7 b) 8 c) 15 d) 71

4) In the opposite figure:



Find the probability that the pointer stop at a number greater than 6 equal …………..

a) $\frac{1}{8}$ b) $\frac{1}{4}$ c) $\frac{3}{8}$ d) $\frac{3}{4}$

5) $\sqrt{100 - (-6)^2}$ = …………

a)4 b) 8 c) -8 d) 16

(3)

a) Find the value of the expression: $12 \times (2)^2 \div 24 + 3^2$

b) If $x = -\frac{1}{2}$, $y = \left|\frac{-3}{4}\right|$, find the numerical value of $\left(\frac{y}{x^2}\right)^{-2}$

(4)

a) Find in $\mathbb{Q}$ the solution set of each of the following:

i) $3 - 4x = -5$ ii) $2x - 1 \geq 5$

b) Simplify: $\frac{n}{2}[\,3n - 6\,] + \frac{1}{2}[\,6 - 2n\,]$, then find its value when n = 1

(5)

a) The sum of the age of 3 sisters now is 25 years. If the eldest was born before the middle by 3 years, and the middle was born before the youngest by 2 years. Find the age of each of them now.

b) A box contains 4 white, 5 red and 6 blue balls. A ball is drawn randomly from the box. Calculate the probabilities of the following events.

i) the ball is red. ii) the ball is white or red.

Model Answers

Exercise (1)

(1) Complete:

1) $-6\,a^3b^5$ 2) 9 3) 5 4) $\left(\frac{2}{3}\right)^3$

(2) Choose the correct answer:

1) a 2) c 3) b 4) d

(3)

a) $5^{-2+5-3} = 5^0 = 1$ b) 100.000

c) $x \le \frac{10}{4}$ $s.s = \{ x : x \in \mathbb{Q} , x \le \frac{10}{4} \}$

d) $x + x + 2 + x + 4 = 204$

$3x + 6 = 204$

$3x = 198$

$x = \frac{198}{3} = 66$

$x + 2 = 68$ $x + 4 = 70$

Exercise (2)

(1) Complete:

1) 6 2) 14 3) $3 - 2x$ 4) 8

(2) Choose the correct answer:

1) b 2) d 3) b 4) b 5) c

(3) a) $-\left(\frac{1}{2}\right)^5$ b) $\frac{4}{9}$

c) $-2x > -1$

$x < 1$ S.S = { 1, 0 , – 1 }

d) w = x L = 2x

$2x - 5 = x + 6$

$2x - x = 6 + 5$

$x = 11$ $2x = 22$

Area = L × w = 11 × 22 = 242 cm^2

Exercise (3)

(1) Complete:

1) 3×10^{-5} 2) 8

3) $x = \frac{-2}{3}$ s.s = { $\frac{-2}{3}$ } 4) >

(2) Choose the correct answer:

1) b 2) b 3) a

(3) a) $1 + 3 < x - 3 + 3 \leq 6 + 3$

$4 < x \leq 9$

S.S = { $x : x \in \mathbb{Q} , 4 < x \leq 9$ }

b) son = x father = 3x

$x + 2 + 3x + 2 = 52$

$4x = 48$ $x = \frac{48}{4} = 12$

father = 12 × 3 = 36

c) $7^{(-3+5-2)} = 7^0 = 1$ d) $\frac{9}{8}$

Statistic

Exercise (1)

(1) Complete:

1) 1 2) $\frac{1}{2}$ 3) $\frac{1}{7}$

(2) Choose the correct answer:

1) b 2) c 3) a

(3) a) 0.15

b) Total × $\frac{1}{6}$

Total = $\frac{1}{6}$ ÷ 2

no. of red = 12 - 6 = 6

c) s.s = { 22 , 23 , 25 , 33 , 35 , 32 , 55 , 53 , 52 }

i) = 0 ii) = $\frac{3}{9}$ = $\frac{1}{3}$

Exercise (2)

(1) Complete:

1) 0 2) $\frac{1}{6}$ 3) $\frac{2}{5}$

(2) Choose the correct answer:

1) b 2) b 3) b

(3) a) $\frac{4}{15}$

b) 1st : 0 2nd : $\frac{1}{2}$

c) i) $\frac{3}{8}$ ii) $\frac{1}{2}$

Exercise (3)

(1) Complete:

1) 0 , 1   2) $\frac{1}{2}$ 3) 0.15

(2) Choose the correct answer:

1) a   2) d   3)

(3) a) $\frac{7}{10}$ b) $\frac{2}{15}$

c) s.s = { 23 , 25 , 32 , 35 , 52 , 53 }

1st : $\frac{2}{6} = \frac{1}{3}$ 2nd : $\frac{4}{6} = \frac{2}{3}$

Model (1)

(1) Complete:

1) 10   2) $x = 2$ 3) $x \geq 3$

4) 3.5×10^{-3} 5) $\frac{4}{9}$

(2) Choose the correct answer:

1) b   2) a   3) a   4) a   5) a

(3) Simplify to the simplest form:

a) $\frac{4}{25}$ b)

(4) a)

1st s.s = { 8 }

2nd s.s = $\{ x : x \in \mathbb{Q} , x < \frac{11}{2} \}$

b) $3 \times (1.02)^2 \times 10^6 = 3.1212 \times 10^6$

(5) 1st = $\frac{80}{800} = \frac{1}{10}$ 2nd = $\frac{600}{800} = \frac{3}{4}$

Model (2)

(1) Complete:

1) 1 2) $\frac{4}{7}$ 3) 0 4) 13 , 21 5) 90

(2) Choose the correct answer:

1) b 2) d 3) a 4) b 5) c

(3) a) $5x - 2x = 30$

$3x = 30$

$x = 10$ $1^{st} = 50$ $2^{nd} = 20$

b) $5^0 = 1$

(4) a) i) s.s = { 2 } ii) s.s = $\{x : x \in \mathbb{Q}\ x < 4\}$

b) zero

(5) a) i) $\frac{1}{6}$ ii) $\frac{1}{3}$

b) $w = x$ $L = 2x$

$x \times 2x = 12.5\ cm^2$

$2x^2 = 12.5$ $x^2 = \frac{12.5}{2} = 6.25$

$x = \sqrt{6.25} = 2.5$ cm $\leftarrow w$

$L = 2 \times 2.5 = 5$ cm

Model (3)

(1) Complete:

1) 1 2) $\frac{1}{5}$, $\frac{1}{4}$ 3) { $\frac{1}{2}$ } 4) $\frac{4}{3}$ 5) - 5

(2) Choose the correct answer:

1) $\frac{4}{3}$ 2) c 3) b 4) b 5) b

(3)

(4) a) i) = { 2 }

ii) = { x : x ∈ $\mathbb{Q}$, x ≤ 2 }

b) time = $\frac{S}{V} = \frac{1.44 \times 10^8 \times 1000}{3 \times 10^8}$ = 480 sec. = 8 mins.

(5) a) 4.24×10^5 b) i) $\frac{1}{2}$ ii) $\frac{1}{2}$

Model (4)

(1) Complete:

1) $\frac{1}{2}$ 2) 1 3) { 3 , 4 } 4) $\frac{-2}{5}$ 5) $\frac{31}{32}$, $\frac{63}{64}$

(2) Choose the correct answer:

1) b 2) b 3) b 4) d 5) c

(3) a) $\frac{1}{36}$

b) big no = x small = x – 5

x + x – 5 = 15 x = 10

(4) a) 1st = { 6 } 2nd = { x : x ∈ $\mathbb{Q}$, x < $\frac{5}{2}$ }

b)

(5) a) 1) $\frac{3}{4}$ 2) $\frac{3}{4}$

b) $[(7)^{4-2-3}]^{-2} = (7^{-1}) = 7^2 = 49$

Model (5)

(1) Complete:

1) $\frac{1}{2}$ 2) 1 3) -2 4) $\frac{3}{8}$ 5) 4^{19}

(2) Choose the correct answer:

1) c 2) a 3) c 4) b 5) b

(3) a) 11 b) $-\frac{1}{9}$

(4) a) i) = { 2 } ii) = { x : x ∈ $\mathbb{Q}$, x ≥ 3 } b) $\frac{1}{2}$

(5) a) x + x + 2 + x + 5 = 25

3x + 7 = 25

3x = 18 x = 6

x + 2 = 8 x + 5 = 11

b) i) $\frac{5}{15} = \frac{1}{3}$ ii) $= \frac{9}{15} = \frac{3}{5}$

FIRST: ALGEBRA

Choose the correct answer :

1.	The sum of the probabilities for all possible outcomes of a randomly experiment is .... (a) zero (b) 1 (c) > 1 (d) < 1
2.	If $3a = \sqrt{4}\,b$, then $\frac{a}{b} =$ .... (a) 2 : 3 (b) 3 : 2 (c) 3 : 4 (d) 4 : 3
3.	$\left(\frac{-2}{3}\right)^{-3}$ equals .... (a) $\frac{-27}{8}$ (b) $\frac{-8}{27}$ (c) $\frac{8}{27}$ (d) $\frac{27}{8}$
4.	There are 21 boys and 15 girls in a classroom , one pupil is chosen randomly , the probability that the chosen pupil is a girl = ... (a) $\frac{5}{12}$ (b) $\frac{7}{12}$ (c) $\frac{4}{7}$ (d) $\frac{5}{6}$
5.	$\sqrt{(-8)^2 + (-6)^2} =$ .... (a) $\|-10\|$ (b) ± 10 (c) 14 (d) – 14
6.	$2^3 \times 2^3 =$ .... (a) 2^6 (b) 2^8 (c) 2^{15} (d) 2^{53}
7.	Which of the following is the greatest ? (a) 2.3×10^4 (b) 2.3×10^5 (c) 3.2×10^4 (d) 3.2×10^5
8.	The side length of a square whose area $9x^2$ cm^2 is .... cm. where $x > 0$ (a) $3x$ (b) $3x^2$ (c) $9x$ (d) $9x^2$

9. Which of the following may be probability of an event ?

(a) – 0.25 (b) 87 % (c) 1.05 (d) 130 %

10. If $-x > 4$, then ……………

(a) $x > -4$ (b) $x > 4$ (c) $x < -4$ (d) $x < 4$

11. $\left(\frac{-2}{3}\right)^2 =$ ……………

(a) $\frac{4}{9}$ (b) $\frac{-4}{9}$ (c) $\frac{4}{6}$ (d) $\frac{-4}{6}$

12. $\left(\frac{4}{7}\right)^0 =$ ……………

(a) 0 (b) 1 (c) $\frac{4}{7}$ (d) – 1

13. $(7)^{-2} =$ ……………

(a) 49 (b) $\frac{1}{49}$ (c) 14 (d) – 14

14. $\sqrt{9+16} =$ ……………

(a) 7 (b) 5 (c) 25 (d) – 7

15. The multiplicative inverse of $\sqrt{\frac{100}{25}}$ is ……………

(a) $\pm\frac{10}{5}$ (b) $\pm\frac{5}{10}$ (c) $\frac{10}{5}$ (d) $\frac{5}{10}$

16. The age of Amr now is x years , then his age 5 years ago is ……………

(a) $5x$ (b) $x - 5$ (c) $5 - x$ (d) $x + 5$

17. If $-x < 3$, then ……………

(a) $x > 3$ (b) $x > -3$ (c) $x < 3$ (d) $x < -3$

18. If a = b , then $\left(\frac{3}{7}\right)^{b-a}$ equal ……………

(a) zero (b) 1 (c) $\frac{3}{7}$ (d) $\frac{7}{3}$

19. The probability of the certain event equals ……………

(a) zero (b) 1 (c) 2 (d) $\frac{1}{2}$

20. ✱ The quarter of the number 4^{20} = ...

(a) 4^5 (b) 4^{10} (c) 4^{19} (d) 2^{10}

21. If $4x = 20$, then $3x - 1$ = ...

(a) 14 (b) 15 (c) 16 (d) 17

22. A coin is tossed once , then probability of getting (Tail) = ...

(a) $\frac{1}{2}$ (b) $\frac{1}{6}$ (c) 1 (d) 0

23. The probability of certain event = ...

(a) 0 (b) 1 (c) 2 (d) 3

24. The S.S. of the inequality $x < 0$ in $\mathbb{N}$ is ....

(a) $\{0\}$ (b) $\{1\}$ (c) $\{0 , 1\}$ (d) $\varnothing$

25. $\sqrt{x^8}$ = ...

(a) x^8 (b) x^5 (c) x^6 (d) x^4

26. ✱ If $x = y$, then $\left(\frac{1}{5}\right)^{x-y}$ = ...

(a) $\frac{1}{5}$ (b) 1 (c) 5 (d) zero

27. $3^5 \times 2^5$ = ...

(a) 5^{10} (b) 6^{10} (c) 6^5 (d) 6^{25}

28. If $5x = 15$, then 2^x = ...

(a) 2 (b) 8 (c) 3 (d) 9

29. $\sqrt{\frac{25}{49}}$ = ...

(a) $\frac{5}{7}$ (b) $\frac{-5}{7}$ (c) $\pm\frac{5}{7}$ (d) $\frac{7}{5}$

30. A class contain 50 students , 40 of them are succeed in test , then the probability of failed is equal ....

(a) $\frac{4}{5}$ (b) $\frac{1}{5}$ (c) $\frac{5}{4}$ (d) $\frac{1}{10}$

31. ✱ The multiplicative inverse of $\left(\frac{-3}{7}\right)^0$ = ...

(a) $\frac{3}{7}$ (b) $-\frac{7}{3}$ (c) 1 (d) -1

32.	$\sqrt{\frac{4}{49}} =$ …………… (a) $\frac{2}{7}$ (b) $\frac{3}{7}$ (c) $\frac{4}{49}$ (d) $\frac{1}{9}$
33.	$6 \times 2 - 4 \div 2 =$ …………… (a) 1 (b) 2 (c) 10 (d) 12
34.	Which of the following is the probability of occurrence of an event ? (a) -0.25 (b) 75% (c) 1.2 (d) 315%
35.	If $x + 9 = 11$, then $7x =$ …………… (a) 2 (b) 9 (c) 11 (d) 14
36.	If the age of Ahmed now is x years , then his age 5 years ago is …………… (a) $x + 5$ (b) $x - 5$ (c) $x \div 5$ (d) $5x$
37.	✱ $3^{10} + 3^{10} + 3^{10} =$ …………… (a) 3^{10} (b) 3^{30} (c) 9^{10} (d) 3^{11}
38.	The S.S. of the inequality $x < 2$ in $\mathbb{N}$ is …………… (a) $\{0\}$ (b) $\{1\}$ (c) $\{1, 0\}$ (d) $\varnothing$

Complete each of the following :

1.	If $7 - 2x = 3$, then $x =$ …………… where $x \in \mathbb{Q}$
2.	If $3x + 1 \geq 10$, then $x \geq$ …………… where $x \in \mathbb{Q}$
3.	The standard form of the number $0.7 \times 0.005 =$ ……………
4.	The probability of the certain event = ……………
5.	$\left(\frac{-2}{3}\right)^0 =$ ……………
6.	$\sqrt{\frac{16}{49}} =$ ……………

7.	The probability of the impossible event = ……………
8.	1 , 2 , 3 , 5 , 8 , …………… , …………… (In the same pattern)
9.	If the probability that the student is absent in a school is 0.15 , if the number of students of this school is 600 , then the number of the present students that day is ……………
10.	If $x + 2 = 6$, then $x =$ ……………
11.	When tossing a coin once , then the probability of the appearance of a tail = ……………
12.	The probability of the impossible event = ……………
13.	$\sqrt{\left(\frac{2}{5}\right)^2} =$ ……………
14.	$7 (6^2 - 5 \times 6) =$ ……………
15.	$(3\,a^2)^{-1} = \frac{1}{\cdots\cdots}$
16.	0.75×10^8 in the standard form is …………… × ……………
17.	$-\sqrt{4^2} =$ ……………
18.	If a die is thrown once then the probability of appearance number 3 on the upper face = ……………
19.	The S.S. of the equation $x + 17 = 13$, $x \in \mathbb{N}$ is ……………
20.	The probability of the impossible event = ……………
21.	If $3\,x + 1 = 16$, then the value of $4\,x =$ ……………
22.	$\sqrt{\frac{144}{169}} =$ ……………
23.	$3^{zero} =$ ……………
24.	$\sqrt{9 + 16} = 3 +$ ……………
25.	If $-1 \leq -x < 3$, then $x \in$ …………… in $\mathbb{N}$

26.	If the age of Omar now is x years , then his age after 3 years is .... years.
27.	If $2x = 5$, then $6x - 5 =$ ....
28.	$(x-2)^{zero} = 1$ if $x \neq$ ....
29.	The solution set of the inequality : $-x > -1$ in $\mathbb{N}$ is ....
30.	If the probability of success of a student is 0.7 , then the probability of his failure = ...
31.	If $2x = \sqrt{36}$, then $3x - 4 =$ ....
32.	If a coin is flipped once , then the probability of appearance a head equals ....
33.	The standard form of 0.000057 = ...
34.	$\sqrt{(-8)^2 + 6^2} =$ ....
35.	The multiplicative inverse of the number $-\sqrt{\frac{9}{16}} =$ ....
36.	The side length of a square whose area is $49x^2$ cm^2 is .... cm.
37.	A coin tossed 160 times , then an approximate expected number of the appearance of a head is ....
38.	The probability of the certain event = ...

Essay problems:

1.	**Simplify to the simplest form :** $\left(-\frac{3}{7}\right)^0 \times \left(\frac{-2}{5}\right)^2 \times \sqrt{6\frac{1}{4}}$
2.	**Find the numerical value of the expression :** $3ab + 8a \div (4b)$ when $a = 4$, $b = -2$

3. **Find in Q the S.S. of the following :**

① $3x + 1 = 25$ ② $2x + 5 < 16$

4. **The population of a city has been growing according to the rule :** $y = 3\,(1.02)^n$ million.

Where y is the population and n is the number of years.

Calculate the population that will be in 2 years in the standard form.

5. **A factory of a tire record the distance that traveled by a certain type of them before damage for 800 units of this type as following.**

The distance in thousand (km.)	Less than 50	50 to 100	More than 100 till 150	More than 150
The number of damage tire	80	120	280	320

If you bought a tyre of this type , what is the probability of change it :

① Before traveled 50 thousand km.

② After traveled more than 100 thousand km.

6. Find the value of $\frac{5^{-4} \times 5^7}{5^3}$ in the simplest form.

7. **Find in Q the S.S. of each of the following :**

① $(3x + 2) + 5 = 13$

② $2x + 15 < 19$

8. **Find the value of the expression in simplest form :**

$$\left(\frac{-1}{3}\right)^2 + \sqrt{\frac{64}{81}} - \left(\frac{3}{7}\right)^0$$

9. If a regular die is thrown once and observed the number on upper face ,

find the probability of each of the following :

① Getting a prime even number.

② Getting an odd number less than 4

10. If $x = -\frac{1}{2}$, $y = -\frac{3}{4}$ **, find in the simplest form :** $\left(\frac{y}{x^2}\right)^{-2}$

11.	**Simplify to the simplest form :** ① $\frac{7^{-3} \times 7^5}{7^2}$ ② $\left(\frac{1}{2}\right)^2 \times \left(\frac{-1}{2}\right)^3$
12.	**Find in Q the S.S. of the following :** ① $8 + 2x = 14$ ② $3x - 1 \leq 2x + 3$
13.	**Evaluate the numerical value of following expressions when t = 2 , a = 5 :** ① $\frac{a - t}{a^3}$ ② $\frac{6^2}{a - 1}$
14.	**Simplify :** $\left(-\frac{1}{3}\right)^2 + \sqrt{\frac{64}{81}} - \left(\frac{3}{7}\right)^0$
15.	A box contains 5 white balls , 4 black balls and 7 red balls. A ball is drawn randomly from the box. **Calculate the probability of the following events :** ① The ball is white. ② The ball is red. ③ The ball is not white.
16.	**Find S.S. in Q :** $3x + 1 \geq 2x + 5$
17.	A fair die is rolled once and observe the number on the upper face **Find the probability of getting :** ① a prime number ② a number less than 7
18.	**Find S.S. in Q :** $3x - 4 = 2x + 5$
19.	**Simplify to the simplest form :** $\left(\frac{9^3 \times 9}{9^5}\right)^{-3}$
20.	A bag contains 3 red balls , 4 green balls and 2 black balls. **Find the probability when the selected ball is :** ① red. ② green. ③ white.
21.	**Find in Z the solution set of :** ① $3x - 5 = 7$ ② $2x - 3 \leq 5$
22.	**Put the following expression in the simplest form :** $\frac{(-x)^4 \times x^7}{(x^2)^3}$ where $x \neq 0$

23.	**Calculate :** ① $\frac{(-3)^5 \times (-3)^4}{(-3)^7 \times (-3)}$ ② $\frac{(5)^2 + (5)^4}{(5)^3}$
24.	If $x = \frac{1}{2}$, $y = \frac{-3}{2}$, $z = \frac{3}{4}$ **Find the value of :** $\left(\frac{x+y}{z}\right)^{-2}$
25.	A card is chosen randomly from ten cards numbered from 5 to 14 **what is the probability that the chosen card is :** ① An even number ② A prime number
26.	If $x = \frac{3}{4}$, $y = \frac{-3}{2}$ **, then find the numerical value of :** $\left(\frac{x}{y}\right)^2$
27.	**Simplify :** $\left(\frac{-3}{2}\right)^2 \times \sqrt{\frac{64}{9}} \times \left(\frac{2}{7}\right)^0$
28.	If $x \in \mathbb{Q}$ **, find the S.S. of the following equation :** $3x - 1 = 14$
29.	If $x \in \mathbb{Q}$ **, find the S.S. of the following inequality :** $3x - 2 < 7$
30.	A fair die is rolled once **, calculate the probability of rolling :** ① An even number ② A number greater than 2
31.	**Find the S.S. in $\mathbb{Q}$:** ① $3(x+2) = 12$ ② $2x + 13 < 21$
32.	**Find the result of the following in the standard form :** $(4.4 \times 10^5) \div (2 \times 10^3)$
33.	**Find the value of the following :** $\left(\frac{-2}{3}\right)^{zero} \times \sqrt{\frac{16}{81}} \times \frac{3}{4}$
34.	If $x = \frac{3}{4}$, $y = \frac{1}{3}$ **, then find the value of :** $(x^2 y^2)^{-3}$
35.	A box contains of 6 red balls , 4 blue balls , 3 white balls. A ball is drawn randomly from the box. **Calculate the probability of :** ① The drawn ball is white ② The drawn ball is not blue.

36.	If $x = 3$ and $y = 2$ **, then find the numerical value of :** $16\,x \div (4\,y) + 3\,x\,y$
37.	A card selected randomly from ten cards numbered from 1 to 10 **What is the probability that selected card shows :** ① An odd number ② A prime even number. ③ Non-prime number.
38.	**Simplify to the simplest form :** **[a]** $\frac{3^5 \times 3^{-2}}{3^3}$ **[b]** $\left(\frac{-5}{3}\right)^2 \times \left(\frac{-4}{9}\right)^0 \times \sqrt{3\frac{6}{25}}$
39.	**Find in Q the S.S. of the following :** **[a]** $3\,x + 5 > 20$ **[b]** $2\,x + 8 = 13 - 5\,x$

FIRST: ALGEBRA

Choose the correct answer :

1. If $\frac{6x}{5} = -2$, then $x^2 = \dots\dots\dots$

   (a) $-\frac{25}{9}$ (b) $\frac{5}{9}$ (c) $\frac{25}{9}$ (d) $\frac{25}{3}$

2. A die is thrown once and observed the upper face the probability of appearance number is divisible by 3 = ……………

   (a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{3}{4}$

3. $\sqrt{9} + \sqrt{4} = \sqrt{\dots\dots}$

   (a) 13 (b) 5 (c) 25 (d) $\sqrt{13}$

4. If $\sqrt{\frac{a}{b}} = \frac{2}{3}$, then $\frac{b}{a} = \dots\dots\dots$

   (a) $\frac{9}{4}$ (b) $\frac{3}{2}$ (c) $\frac{4}{9}$ (d) $\frac{2}{3}$

5. If $-x < 3$, then ……………

   (a) $x > 3$ (b) $x < 3$ (c) $x < -3$ (d) $x > -3$

6. ✱ $4^x + 4^x + 4^x + 4^x = \dots\dots\dots$

   (a) 4^{x+4} (b) 4^{4x} (c) 4^{x+1} (d) $4x^4$

7. Which of the following may be the probability of an event ?

   (a) 25 (b) 87% (c) 1.05 (d) 130%

8. The S.S. of the inequality $2x + 1 \geq 0$ in $\mathbb{N}$ is ……………

   (a) $\mathbb{Z}_+$ (b) $\varnothing$ (c) $\mathbb{N}$ (d) $\{0\}$

9.	If $x = y$, then $5^{x-y} =$ .... (a) 5 (b) 1 (c) 0 (d) – 1
10.	If $\frac{6x}{5} = -2$, then $x^2 =$ .... (a) $\frac{-25}{9}$ (b) $\frac{5}{9}$ (c) $\frac{25}{9}$ (d) $\frac{25}{3}$
11.	If $-x < 5$, then .... (a) $x > 5$ (b) $x > -5$ (c) $x < 5$ (d) $x < -5$
12.	* $\frac{6a^2x^4}{2a^3x^3} =$ .... (a) $3ax$ (b) $3a^5x^7$ (c) $\frac{3x}{a}$ (d) $\frac{3}{ax}$
13.	The number which in the standard form between the following numbers is .... (a) 11×10^8 (b) 9.7×10^{-5} (c) 10.3×10^{-3} (d) 0.87×10^8
14.	The half of the number 2^{16} is .... (a) 2^8 (b) 1^8 (c) 2^6 (d) 2^{15}
15.	$\left(\frac{-2}{3}\right)^{-3} =$ .... (a) $\frac{-27}{8}$ (b) $\frac{-8}{27}$ (c) $\frac{8}{27}$ (d) $\frac{27}{8}$

Complete each of the following :

1.	The S.S in $\mathbb{N}$ of $3x + 7 = 4$ is ....
2.	If the area of a circle 49π cm^2 , then the radius length = ... cm.
3.	If the probability of succeeded student is $\frac{4}{5}$, then the probability of failed is ....%
4.	If $2x + 3 = 15$, then $\frac{1}{3}x =$ ....
5.	$3x + 5 \geq 10$ where $x \in \mathbb{Q}$, then S.S. = ...
6.	If $x + 1 = 2$, then $2x =$ ....

7.	The probability of impossible event = ……………
8.	If $\frac{x}{y} = \frac{3}{2}$, then $\frac{2x}{3y} =$ ……………
9.	If $k - 5 < 0$, then $k <$ ……………
10.	$\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{15}{16}$, …………… , …………… (In the same pattern)

Essay problems:

1.	**Find in $\mathbb{Q}$ the S.S. of the following :** $3x + 3 = 8$ …………………………………………………………………………
2.	**Find the S.S. of the following :** $3 - 2x \geq 1$, $x \in \mathbb{N}$ …………………………………………………………………………
3.	**Simplify :** $\left(-\frac{3}{7}\right)^0 \times \left(-\frac{2}{5}\right)^2 \times \sqrt{6\frac{1}{4}}$ (Show steps) ………………………………………………………………………… …………………………………………………………………………
4.	A box contains 15 cards numbered from 1 to 15 , A card is drawn randomly find the probability of : ① The drawn card carries a prime number ② The drawn card carries a number divisible by 3 ③ The drawn card carries a perfect square number
5.	If $\frac{x}{27} = \frac{3}{x}$ Find the value of x …………………………………………………………………………
6.	**Find in $\mathbb{Q}$ the S.S. of the following equation :** $3 - 4x = -5$ …………………………………………………………………………

7.	A card selected randomly from ten cards numbered from 1 to 10 What is the probability that selected card shows ? ① An odd number. ② A prime even number.
8.	**Find the solution set of the following in $\mathbb{Q}$:** $2x + 6 < 16$ ....
9.	**Find the solution set of the following inequality where $x \in \mathbb{Q}$:** $5x - 4 \geq 2x + 11$ ....
10.	**Simplify :** $\left(\frac{2^5 \times 3^2}{3^4 \times 2^3}\right)^{-1}$
11.	**Find the value of expression in simplest form :** $\left(\frac{-1}{3}\right)^2 + \sqrt{\frac{64}{81}} + \left(\frac{3}{7}\right)^0$ ....
12.	**Simplify :** $\left(\frac{9^3 \times 9}{9^5}\right)^{-3}$
13.	The probability of the absence of a student in one day = 0.15 , and the number of students in this school = 600 students. Find the number of present students in the school in this day. ....
14.	**Find the value of :** $\frac{(-2)^5 \times 2^4}{(-2)^3 \times 2^2}$
15.	**Find the value of expression in simplest form :** $\left(\frac{-1}{3}\right)^2 + \sqrt{\frac{64}{81}} + \left(\frac{3}{7}\right)^0$ ....

Algebra

choose:

(1) b	(2) a	(3) a	(4) a
(5) a	(6) a	(7) d	(8) a
(9) b	(10) c	(11) a	(12) 1
(13) b	(14) b	(15) d	(16) b
(17) b	(18) b	(19) b	(20) c
(21) a	(22) a	(23) b	(24) d
(25) d	(26) b	(27) c	(28) b
(29) a	(30) b	(31) c	(32) a
(33) c	(34) b	(35) d	(36) b
(37) d	(38) c		

Complete:

(1) 2	(2) 3	(3) 3.5×10^{-3}	
(4) 1	(5) 1	(6) $\frac{4}{7}$	(7) zero
(8) 13, 21	(9) 510	(10) 4	(11) $\frac{1}{2}$
(12) zero	(13) $\frac{2}{5}$	(14) 42	(15) $3a^2$
(16) 7.5×10^{7}		(17) -4	(18) $\frac{1}{6}$
(19) ϕ	(20) zero	(21) 20	(22) $\frac{12}{13}$
(23) 1	(24) 2	(25) $\{0, 1\}$	(26) $x+3$
(27) 10	(28) 2	(29) $\{0\}$	(30) 0.3
(31) 5	(32) $\frac{1}{2}$	(33) 5.7×10^{-5}	
(34) 10	(35) $\frac{-4}{3}$	(36) $7x$	
(37) 80		(38) 1	

Essay problems:

(1) $1 \times \frac{4}{25} \times \frac{5}{2} = \frac{2}{5}$

(2) $3 \times 4 \times -2 + 8 \times 4 \div (4 \times -2)$

$= (-24) + (-4)$

$= -28$

(3) ① $x = \frac{25-1}{3}$, $x = 8$, S.S. $= \{8\}$

② $x < \frac{16-5}{2}$, $x < \frac{11}{2}$

S.S. $= \{x : x \in Q, x < \frac{11}{2}\}$

(4) $y = 3(1.02)^2 \times 1000000$

$= 3121200 = 3.1212 \times 10^6$

(5) ① $P(<50) = \frac{80}{800} = \frac{1}{10}$

② $P(>100) = \frac{280+320}{800} = \frac{3}{4}$

(6) $5^{-4+7-3} = 5^0 = 1$

(7) ① $3x + 7 = 13$, $x = \frac{13-7}{3}$

$x = 2$, S.S. $= \{2\}$

② $x < \frac{19-15}{2}$, $x < 2$

S.S. $= \{x : x \in Q, x < 2\}$

(8) $\frac{1}{9} + \frac{8}{9} - 1 = 1 - 1 = \text{zero}$

(9) ① $\frac{1}{6}$ ② $\frac{2}{6} = \frac{1}{3}$

(10) $\left(\frac{-3}{4} \div \frac{1}{4}\right)^{-2} = (-3)^{-2} = \frac{1}{9}$

(11) ① $7^{-3+5-2} = 7^0 = 1$

② $\frac{1}{4} \times \frac{-1}{8} = \frac{-1}{32}$

(12) ① $x = \frac{14-8}{2}$, $x = 3$, S.S. $= \{3\}$

② $3x - 2x \leq 3 + 1$, $x \leq 4$

S.S. $= \{x : x \in Q, x \leq 4\}$

(13) ① $\frac{5-2}{5^3} = \frac{3}{125}$ ② $\frac{36}{5-1} = 9$

إعداد/ محمود أحمد محب

(14) $\frac{1}{9}+\frac{8}{9}-1=1-1=0$

(15) ① $\frac{5}{16}$ ② $\frac{7}{16}$ ③ $\frac{11}{16}$

(16) $3x-2x\geqslant 5-1$, $x\geqslant 4$
S.S. $=\{x: x\in Q,\ x\geqslant 4\}$

(17) ① $\frac{3}{6}=\frac{1}{2}$ ② $\frac{6}{6}=1$

(18) $3x-2x=5+4$, $x=9$
S.S. $=\{9\}$

(19) $(9^{3+1-5})^{-3}=(9^{-1})^{-3}=9^{3}=729$

(20) ① $\frac{3}{9}=\frac{1}{3}$ ② $\frac{4}{9}$ ③ zero

(21) ① $x=\frac{7+5}{3}$, $x=4$, S.S. $=\{4\}$
② $x\leqslant\frac{5+3}{2}$, $x\leq 4$
S.S. $=\{4,3,2,1,0,-1,\ldots\}$

(22) $\frac{x^4\times x^7}{x^6}=x^{4+7-6}=x^5$

(23) ① $(-3)^{5+4-7-1}=(-3)^1=-3$
② $\frac{25+625}{125}=\frac{650}{125}=\frac{26}{5}$

(24) $\left[\left(\frac{1}{2}+\frac{-3}{2}\right)\div\frac{3}{4}\right]^{-2}=\left(-1\times\frac{4}{3}\right)^{-2}$
$=\left(\frac{-4}{3}\right)^{-2}=\left(\frac{-3}{4}\right)^{2}=\frac{9}{16}$

(25) ① $\frac{5}{10}=\frac{1}{2}$ ② $\frac{4}{10}=\frac{2}{5}$

(26) $\left(\frac{3}{4}\div\frac{-3}{2}\right)^2=\left(\frac{3}{4}\times\frac{-2}{3}\right)^2=\left(\frac{-1}{2}\right)^2=\frac{1}{4}$

(27) $\frac{9}{4}\times\frac{8}{3}\times 1=6$

(28) $x=\frac{14+1}{3}$, $x=5$, S.S. $=\{5\}$

(29) $x<\frac{7+2}{3}$, $x<3$
S.S. $=\{x: x\in Q,\ x<3\}$

(30) ① $\frac{3}{6}=\frac{1}{2}$ ② $\frac{4}{6}=\frac{2}{3}$

(31) ① $3x+6=12$, $x=\frac{12-6}{3}$
$x=2$, S.S. $=\{2\}$
② $x<\frac{21-13}{2}$, $x<4$
S.S. $=\{x: x\in Q,\ x<4\}$

(32) 2.2×10^2

(33) $1\times\frac{4}{9}\times\frac{3}{4}=\frac{1}{3}$

(34) $\left[\left(\frac{3}{4}\times\frac{1}{3}\right)^2\right]^{-3}=\left(\frac{1}{4}\right)^{-6}=4^6=4096$

(35) ① $\frac{3}{13}$ ② $\frac{9}{13}$

(36) $16\times 3\div(4\times 2)+3\times 3\times 2$
$=6+18=24$

(37) ① $\frac{5}{10}=\frac{1}{2}$ ② $\frac{1}{10}$ ③ $\frac{6}{10}=\frac{3}{5}$

(38) ① $3^{5-2-3}=3^0=1$
② $\frac{25}{9}\times 1\times\frac{9}{5}=5$

(39) ① $x>\frac{20-5}{3}$, $x>5$
S.S. $=\{x: x\in Q,\ x>5\}$
② $2x+5x=13-8$, $7x=5$
$x=\frac{5}{7}$ S.S. $=\{\frac{5}{7}\}$

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(30) In $\triangle ABE$

$m(\angle B) = 180 - (45 + 70) = 65^\circ$

In quad. ABCD

$m(\angle DAB) = 360 - (65 + 115 + 65)$

$= 115^\circ$

$\because m(\angle D) = m(\angle B)$ and

$m(\angle A) = m(\angle C)$

$\therefore$ ABCD is a parallelogram

(31) $\because$ L is the midpoint of $\overline{XY}$

and $\overleftrightarrow{LM} \parallel \overline{YZ}$

$\therefore$ M is the midpoint of $\overline{ZX}$

$\therefore XM = 5$ cm

(32) $\because$ ABCD is a rhombus

$\therefore m(\angle ABD) = m(\angle ADB) = 62^\circ$

$\therefore m(\angle A) = 180 - (62 + 62) = 56^\circ$

(33) $2a + a + a + 2a + 2a = 540^\circ$

$\therefore 8a = 540^\circ \quad \therefore a = 67.5^\circ$

(34) In $\triangle DBC$, $\because m(\angle B) = 90^\circ$

$\therefore (BD)^2 = (CD)^2 - (BC)^2 = 25 \text{ cm}^2$

$\therefore BD = \sqrt{25} = 5$ cm

$\therefore AB = 5 + 11 = \boxed{16 \text{ cm}}$

In $\triangle ABC$, $\because m(\angle B) = 90^\circ$

$\therefore (AC)^2 = (AB)^2 + (BC)^2 = 400 \text{ cm}^2$

$\therefore AC = \sqrt{400} = 20$ cm

(35) $m(\angle ABC) = 180 - (50 + 70) = 60^\circ$

$\therefore m(\angle ABC) = m(\angle EBD) = 60^\circ$ (V.O.A.)

$\therefore m(\angle E) = 360 - (60 + 130 + 90)$

$= 80^\circ$

(36) $\because \overline{DE} \parallel \overline{BC}$

$\therefore m(\angle B) = 180 - 100 = 80^\circ$

(interior)

$\therefore m(\angle BAC) = 180 - (80 + 30) = 70^\circ$

(37) $A(-2, 3) \xrightarrow{(2,-1)} A'(0, 2)$

$B(2, 3) \longrightarrow B'(4, 2)$

$C(2, 6) \longrightarrow C'(4, 5)$

(38) $O(0, 0) \xrightarrow{R(O, 180)} O'(0, 0)$

$B(3, 0) \longrightarrow B'(-3, 0)$

$C(0, 4) \longrightarrow C'(0, -4)$

(39) $A(1, 1) \xrightarrow[\text{Refl.}]{x\text{-axis}} A'(1, -1)$

$B(3, 4) \longrightarrow B'(3, -4)$

$C(5, 2) \longrightarrow C'(5, -2)$

(40) $A(4, 3) \xrightarrow{(2,-1)} A'(2, 2)$

$B(-1, 1) \longrightarrow B'(1, 0)$

(Algebra)

choose:

① c	② b	③ c	④ a
⑤ d	⑥ c	⑦ b	⑧ c
⑨ b	⑩ c	⑪ b	⑫ c
⑬ b	⑭ d	⑮ a	

Complete:

① ϕ ② 7cm ③ 20 ④ 2

⑤ $\{x : x \in \mathbb{Q}, x \geq \frac{5}{3}\}$ ⑥ 2

⑦ 0 ⑧ 1 ⑨ 5 ⑩ $\frac{31}{32}, \frac{63}{64}$

Essay problems:

① $x = \frac{8-3}{3}$, $x = \frac{5}{3}$, S.S. = $\{\frac{5}{3}\}$

② $x \le \frac{1-3}{-2}$, $x \le 1$, S.S. = {1, 0}

③ $1 \times \frac{4}{5} \times \frac{5}{2} = 2$

④ ① $\frac{6}{15} = \frac{2}{5}$ ② $\frac{5}{15} = \frac{1}{3}$ ③ $\frac{3}{15} = \frac{1}{5}$

⑤ $x^2 = 81$, $x = \pm 9$

⑥ $x = \frac{-5-3}{-4}$, $x = 2$, S.S. = {2}

⑦ ① $\frac{5}{10} = \frac{1}{2}$ ② $\frac{1}{10}$

⑧ $x < \frac{16-6}{2}$, $x < 5$
S.S. = $\{x : x \in Q , x < 5\}$

⑨ $5x - 2x \geq 11 + 4$, $3x \geq 15$
$x \geq 5$, S.S. = $\{x : x \in Q , x \geq 5\}$

⑩ $(2^{5-3} \times 3^{2-4})^{-1} = (2^2 \times 3^{-2})^{-1} = (\frac{4}{9})^{-1} = \frac{9}{4}$

⑪ $\frac{1}{9} + \frac{8}{9} + 1 = 1 + 1 = 2$

⑫ $(9^{3+1-5})^{-3} = (9^{-1})^{-3} = 9^3 = 729$

⑬ Absent = 0.15 × 600 = 90 students.
present = 600 − 90 = 510 students.

⑭ $\frac{\not{2}(2)^5 \times (2)^4}{\not{2}(2)^3 \times 2^2} = 2^{5+4-3-2} = 2^4 = 16$

⑮ $\frac{1}{9} + \frac{8}{9} + 1 = 1 + 1 = 2$

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Geometry

choose:

① b ② c ③ a ④ c
⑤ c ⑥ a ⑦ d ⑧ a
⑨ c ⑩ b ⑪ a ⑫ d
⑬ b

Complete:

① bisects the third side
② 1 ③ (4, 1) ④ 10
⑤ magnitude and direction
⑥ Parallel ⑦ (2, 4) ⑧ (−3, −2)
⑨ (−4, −1) ⑩ $(XY)^2 + (YZ)^2$
⑪ (5, −1)

Essay problems:

① As no. (12) P.(4)

② As no. (5) P.(3)

③ As no. (34) P. (6)

④ As no. (35) P.(6)

⑤ $3x + 5x + 2x + 90 = 360$
$\therefore 10x = 270$, $x = 27°$

⑥ As no. (36) P.(6)

⑦ As no.(7) P. (4)

⑧ $\because m(\angle B) = 90°$
$\therefore (BC)^2 = (AC)^2 - (AB)^2 = 64\ cm^2$
$\therefore BC = \sqrt{64} = 8\ cm$

Choose the correct answer from those given:

1.	**Which of the following is the smallest number?** $(314 \times 10^3$ or 3.14×10^4 or 31.4×10^5 or $0.314 \times 10^6)$
2.	**If:** $x = 0.0009$**, then** $\sqrt{x} =$ .... (0.0003 or 0.0081 or 0.003 or 0.03)
3.	$\sqrt{\left(-\frac{2}{3}\right)^2} =$ .... $(\frac{-4}{9}$ or $\frac{-2}{3}$ or $\frac{2}{3}$ or $\frac{4}{9})$
4.	**If:** $-x < 3$**, then** .... $(x > 3$ or $x > -3$ or $x < 3$ or $x < -3)$
5.	**The age of Amer now is** x **year, then his age 5 year ago is** .... $(5x$ or $5 + x$ or $5 - x$ or $x - 5)$
6.	**If** $3y = 15$**, then** $5y =$ .... (5 or 15 or 25 or 125)
7.	**The S.S. of the inequality:** $3 < x \leq 4$ **in** $\mathbb{N}$ **is** .... $(\{3\}$ or $\{4\}$ or $\{3, 4\}$ or $\emptyset)$
8.	**The side length of a square whose area is** $9x^2$ **cm². is** ....**cm.** $(3x$ or $3x^2$ or $9x$ or $9x^2)$

9.	If $x > y$, $z >$ zero, then $x\,z$ .... $y\,z$ ($>$ or $<$ or $=$ or $\leq$)
10.	$\sqrt{9+16} = 3 +$ .... (4 or 2 or 25 or 22)
11.	If $\frac{26}{x} + 1 = 14$, then $x =$ .... (2 or 10 or 13 or 15)
12.	$\sqrt{10^2 - 6^2} =$ .... (4 or 8 or -4 or ± 8)
13.	$4 \times 2^3 - 20 =$ .... (-48 or 4 or 12 or 16)
14.	If $2\,x = 4$, then $3\,x + 1 =$ .... (13 or 4 or 15 or 7)
15.	If $-x < 7$, then .... ($x > 7$ or $x > -7$ or $x < 7$ or $x < -7$)
16.	The multiplicative in verse of the number $\sqrt{\frac{9}{25}}$ is .... ($\frac{5}{3}$ or $\frac{3}{5}$ or $\frac{25}{9}$ or $\frac{9}{25}$)
17.	The S.S. of the equation: $3\,x = -9$ in $\mathbb{N}$ is .... ($\{-3\}$ or $\{-6\}$ or zero or $\emptyset$)

18.	$3.04 \times 10^7 =$ .... ($340\ 000$ or $304\ 000$ or $3\ 400\ 000$ or $30\ 400\ 000$)
19.	$2.37 \times 10^{-4} =$ .... (0.00237 or 0.000237 or 23700 or 0.0000237)
20.	If $0.00079 = 7.9$ a, then a = ... (10^{-1} or 10^{-3} or 10^{-4} or 10^4)
21.	If $0.0000503 = m \times 10^{-5}$, then m = ... (503 or 5.03 or 50.3 or 0.503)
22.	If the thickness of a sheet of paper is 0.012 cm., then a ream of 400 sheet is of height .... (48×10^{-3}cm. or 48×10^{-2}cm. or 4.8×10^{0}cm. or 48 cm.)
23.	Which of following equals $\frac{1}{2}$ milliard? (50×10^8 or 5×10^8 or 0.5×10^8 or 500×10^7)
24.	Which of following is the greatest? (6.3×10^5 or 9.8×10^4 or 5.2×10^5 or 7.3×10^4)
25.	Which of following is the smallest? (0.6×10^5 or 0.25×10^5 or 7×10^4 or 17.5×10^4)
26.	$6\ 000 \times 50 =$ .... (300×10^2 or 30×10^5 or 3×10^5 or 30×10^4)
27.	$45 \times 900 =$ .... (4.05×10^2 or 4.05×10^3 or 4.05×10^4 or 45×10^2)

28.	$0.7 \times 0.005 =$ .... $(3.5 \times 10^3$ or 3.5×10^{-2} or 3.5×10^2 or $3.5 \times 10^{-3})$
29.	$196 \div (7-5)^2 =$ .... (50 or 49 or 28 or 48)
30.	$10 \times 4 - (2 \times 6 - 8) =$ .... (5 or 6 or 36 or 50)
31.	$7\,(6^2 \div 2 \times 3) =$ .... (378 or 300 or 606 or 38)
32.	$9 \times 10 + 20 \div 2 - 3 =$ .... (90 or 80 or 97 or 100)
33.	$3 + [5 + 2(8 \div 4)] =$ .... (10 or 20 or 12 or 30)
34.	$2 + 3\,[4 + (6 \times 3 - 8)] \times 2 =$ .... (80 or 86 or 30 or 56)
35.	$\sqrt{a^4 b^8} =$ .... (a^4b^8 or a^2b^4 or ab or a^4b^2)
36.	The multiplicative in verse of $\sqrt{0.49}$ in simplest from .... ($\frac{10}{7}$ or 10 or 7 or 3.2)

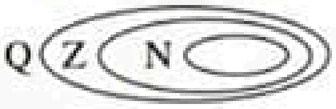
37.	The additive in verse of the number $-\sqrt{\frac{9}{16}}$ in the simplest from .... $(\frac{4}{3}$ or $\frac{3}{4}$ or $\frac{5}{3}$ or $5)$
38.	$\sqrt{1\frac{9}{16}} =$ .... $(1\frac{3}{4}$ or $-1\frac{3}{4}$ or $1\frac{1}{4}$ or $-1\frac{1}{4})$
39.	$\sqrt{10^2 - 6^2} =$ .... $(4$ or 8 or ± 4 or $\pm 8)$
40.	$\sqrt{18 \times 10 \times 10 \times 18} =$ .... $(18$ or 180 or 10 or $100)$
41.	$\sqrt{\sqrt{81}} =$ .... $(81$ or 27 or 9 or $3)$
42.	$\sqrt{2^2 + \sqrt{25}} =$ .... $(3$ or -3 or 9 or $-9)$
43.	If: $\frac{x}{2} = \frac{8}{x}$, then $x =$ .... $(4$ or -4 or ± 4 or $16)$
44.	If: $x = \sqrt{\frac{1}{4}}$, then $x^3 =$ .... $(\frac{3}{8}$ or $\frac{1}{8}$ or $\frac{1}{16}$ or $\frac{1}{64})$

45.	$\sqrt{(a+b)^3(a+b)} =$ .... ($(a+b)^2$ or a^4+b^4 or $-(a+b)^2$ or $\pm(a+b)^2$)
46.	$\sqrt{1}+\sqrt{4}+\sqrt{9}+\sqrt{16}+\sqrt{25}+\sqrt{36}+\sqrt{49}+\sqrt{64} =$ .... (6 or $\sqrt{204}$ or $\sqrt{81}$ or 6^2)
47.	The side length of the square whose area is $16x^2$ cm.^{2}= .... cm. ($8x$ or $4x$ or $2x$ or $8x^2$)
48.	If the age of a man now is x years then his age 5 years ago is .... ($x+5$ or $x-5$ or $5-x$ or x)
49.	If the age of a man now is y years then his age after 4 years is .... ($y+4$ or $y-4$ or $4-y$ or y)
50.	The rectangle with length equals triple its width is the length = x cm., then its width = ... cm. ($3x$ or $\frac{1}{3}x$ or $\frac{2}{3}x$ or x)
51.	If $2x=2$, then $3x-1=$ .... (2 or 3 or 4 or 5)
52.	If $2x=0$, then $x=$ .... (2 or 3 or 5 or zero)
53.	If $2ab=10$, then $3ab=$ .... (5 or 6 or 15 or 30)

54.	If $0.2 + a = 5$, then $\frac{a}{4} =$ .... $(4.8$ or 1.3 or 1.2 or $19.2)$
55.	If $5x + 8x + 2x + 4x = 114$, then $5x + 3 =$ .... $(33$ or 35 or 47 or $8x)$
56.	The S.S. of the equation $\frac{2a}{3} = 8 + 4a$ in $\mathbb{Q}$ is = ... $(\{-2.4\}$ or $\{2.4\}$ or $\left\{-3\frac{1}{3}\right\}$ or $\{0\})$
57.	Which of the following equations is equivalent to equation $x + 3 = 12$? $(x - 3 = -12$ or $x + (-3) = 12)$ $(x - (-3) = 12$ or $x - (-3) = -12)$
58.	Which of the following equations is equivalent to equation $x - 12 = 15$? $(x + 12 = -15$ or $\frac{1}{3}x - 4 = 5)$ $(x - 4 = -5$ or $x + 4 = 5)$
59.	If: $-x < 5$, then .... $(x > 5$ or $x > -5$ or $x < 5$ or $x < -5)$
60.	If $x \in \mathbb{N}$, then the S.S. of the inequality $-x > 3$ is .... $(\{4, 5, \ldots\}$ or $\{-4, -5, \ldots\})$ $(\{-3\}$ or $\emptyset)$
61.	$\frac{x}{3} < 4$ is equal to .... $(x > \frac{4}{3}$ or $x < \frac{4}{3}$ or $x > 12$ or $x < 12)$

62.	If $x \in \mathbb{Z}$, then the S.S. of the inequality $20 < 5x < 25$ is……. $(\{4\}$ or $\{5\}$ or $\{4,5\}$ or $\emptyset)$
63.	The S.S. of the inequality $-2x <$ zero in $\mathbb{Q}$ is ……… $(\emptyset$ or $\mathbb{Q}_+$ or $\mathbb{Q}_-$ or $\mathbb{Z}_+)$
64.	The number of solutions of the inequality $\frac{1}{5} < x < \frac{2}{3}$, where $x \in \mathbb{Q}$ is …….. (zero or 1 or 2 or an infinite number.)
65.	The number 2 belongs to the S.S. of the inequality …….. where x is an integer. $(x > 2$ or $x < 2$ or $-x > -3$ or $-x > 3)$
66.	If $x > 5$, then $-x$ ……….. $(< -9$ or ≥ -5 or < -5 or $> -5)$
67	If $x > y$, then $\frac{1}{x}$ ………. $\frac{1}{y}$, where $x \neq 0, y \neq 0$ $(>$ or $<$ or $=$ or $\geq)$

- **Remember:**
  - ✓ Set of natural numbers (N) = {0 , 1, 2 , 3 , ...}
  - ✓ Set of integers numbers (Z) = { .... , −3 , −2 , −1 , 0 , 1, 2 , 3 ,.......}
  - ✓ Set of rational numbers (Q) = { $\frac{a}{b}$: a , b ∈ Z , b ≠ 0}
  - ✓ $N \subset Z \subset Q$



- **The standard scientific notation of a rational number**

The number is written in the standard form as : **$a \times 10^n$ where $1 \le |a| < 10$ and $n \in Z$**

- **Probability of the event**
  - ✓ $P(A) = \frac{\text{The number of elements ofA}}{\text{The total number of elements of S}} = \frac{n(A)}{n(S)}$
  - ✓ the probability of the **impossible** event = 0
  - ✓ The probability of the **certain event (sure)**= 1
  - ✓ The probability of possible event = proper fraction
  - ✓ For any event A: **$0 \le P(A) \le 1$**
  - ✓ Sum of all probabilities = 1
  - ✓ Set of **Even** numbers { 0 , 2 , 4 , 6 , 8 ,........}
  - ✓ Set of **Odd** numbers { 1 , 3 , 5 , 7 , 9 ,........}
  - ✓ Set of **Prime** numbers { 2 , 3 , 5 , 7 , 11 , 13 , 17 , 19 , 23........}

- **Remember:**

1) If a number = x , then its twice = 2 x and its three times (triple) = 3 x
2) **If a number = x and another number exceeds it by 5 then the other number = x + 5**
3) If a number = x and another number decreases than it by 5 , then the other number = x - 5
4) **If the age of a man now = x years , then :**

   His age after 3 years = (x + 3) years. His age 3 years ago = (x - 3) years.
5) Three consecutive integers are : x , x + 1 and x + 2
6) **Three consecutive natural (even or odd) numbers are x , x + 2 and x + 4**
7) The perimeter of a rectangle = (length + width) × 2
8) **The perimeter of a square = side length × 4**
9) The perimeter of the triangle = the sum of its sides lengths
10) **The area of the triangle = ½ the base length × the height.**
11) The sum of measures of the interior angles of the triangle = 180°

1) **Complete**

a) $2 \times 6 - 4 \div 2 =$ ------------

b) If $3x + 1 \geq 10$, then $x \geq$ ----------

c) the standard form of the number $0.7 \times 0.005 =$ ----------

d) A class has 36 students, the number of boys are 20, if a student is chosen randomly, then the probability that a student is a girl = ---------------

e) Find the solution set $7 - 2x = 3$, $x \in Q$

---

2) **Choose**

a) the sum of all probabilities of all outcomes of a random experiment is -------- (0 , 1 , >1 , <1)

b) if $3a = \sqrt{4}\,b$, then $\frac{a}{b} =$ -------- (2 : 3 , 3 : 2 , 3 : 4 , 4 : 3)

c) $\left(\frac{-2}{3}\right)^{-3} =$ ----------- ($\frac{-27}{8}$, $\frac{-8}{27}$, $\frac{8}{27}$, $\frac{27}{8}$)

d) There are 21 boys and 15 girls in a classroom, one pupil is chosen randomly, the probability of the chosen pupil is a girl = ------------- ($\frac{5}{12}$, $\frac{7}{12}$, $\frac{4}{7}$, $\frac{5}{6}$)

e) $\sqrt{(-8)^2 + (-6)^2} =$ ----------- ($|-10|$, ± 10 , 14 , -14)

---

3) **Simplify** : $\left(\frac{-3}{7}\right)^{0} \times \left(\frac{-2}{5}\right)^{2} \times \sqrt{6\frac{1}{4}}$

4) **The numerical value of $3ab + 8a \div (4b)$, when $a = 4$, $b = -2$**

5) Find the solution set $3x + 1 = 25$, $x \in Q$

6) Find the solution set $2x + 5 < 16$, $x \in Q$

---

7) **Complete:**

a) $\left(\frac{-2}{3}\right)^{0} =$ -----------

b) $\sqrt{\frac{16}{49}} =$ -----------

c) The probability of the impossible event = ---------

d) 1 , 2 , 3 , 5 , 8 , ------- , --------- (in the same pattern)

e) If the probability of a student is absent in a school is 0.15, if the number of students in this school is 600, then the number of the present student that day is ------------

---

8) **Choose**

a) $2^3 \times 2^5 =$ ---------- (2^2 , 2^8 , 2^{15} , 2^{53})

b) Which of the following is the greatest? (2.3×10^3 , 2.3×10^5 , 3.2×10^4 , 3.2×10^5)

c) The side length of a square whose area $9x^2$ is ------------ cm ($3x$, $3x^2$, $9x$, $9x^2$)

d) Which of the following may be the probability of an event? (-0.25 , 87% , 1.05 130%)

e) if $-x > 4$, then ------------ ($x > 4$, $x > -4$, $x < -4$, $x < 4$)

---

9) **Two integers, the smaller is $2x$, and the greater is $5x$, if the difference between them is 30 . Find the two numbers.**

The difference = 30

$5x - 2x = 30$

$3x = 30$

$x = 10$

Then the first $2x = 2 \times 10 = 20$

The second $3x = 3 \times 10 = 30$

10) **If a fair die is thrown once and we observe the number on the upper face, find the probabilities of each of the following events :**

$S = \{1, 2, 3, 4, 5, 6\}$, $n(S) = 6$

a) **A is the event of appearance of a number greater than 4**

$A = \{5, 6\}$, $P(A) = \frac{2}{6} = \frac{1}{3}$

---

11) Find the solution set $(3x + 2) + 5 = 13$, $x \in Q$

12) Find the solution set $2x + 15 < 19$, $x \in Q$

13) **Simplify** : $\left(\frac{-1}{3}\right)^{2} - \left(\frac{3}{7}\right)^{0} + \sqrt{\frac{64}{81}}$

14) Complete:

a) The probability of the certain event (sure) = --------------

b) Find the solution set $2x + 3 = 4$, $x \in Q$

c) when tossed a coin once , the probability of getting a head is -------------

d) If $x = \frac{1}{2}$, $y = \frac{1}{4}$, then $(x + y)^{-1}$ = ----------

e) $0.00037 = 3.7 \times 10^{n}$, then value of n = -------------

15) Choose :

a) The multiplicative inverse of $\sqrt{\frac{9}{16}}$ is --------------- ($\frac{-4}{3}$, $\frac{-3}{4}$, $\frac{3}{4}$, $\frac{4}{3}$)

b) $\frac{x}{2} < 5$ equivalent ------------- ($x < \frac{5}{2}$, $x > \frac{5}{2}$, $x < 10$, $x > 10$)

c) $3^{x} + 3^{x} + 3^{x}$ = ------------- (3^{x} , 3^{x+1} , 27^{x} , $3x^{3}$)

d) there are 480 pupils in a school , 120 of them failed , a pupil is chosen at a random , then the probability that the pupil succeed --------------- (0.25% , 0.75 , 0.8 , 0.667)

e) if x = y , then $\left(\frac{-2}{3}\right)^{x-y}$ = ----------- (0 , 1 , $\frac{-2}{3}$, $\frac{2}{3}$)

16) What is the number which we add it to its three times, the result is 28?

Let the number = x

$x + 3x = 28$

$4x = 28$

$x = 7$

Then the number = 7

17) If the area of the a square equal the area of the triangle whose base length is 9 cm , its height is 8 cm , find the side length of the square .

Area of the triangle = ½ × b × h

= ½ × 9 × 8 = 36 cm^2

Area of the a square = 36 cm^2

$S^2 = 36$ $\sqrt{S^2} = \sqrt{36}$ Then S = 6

18) Simplify $\frac{5^{-4} \times 5^{7}}{5^{3}}$

19) Find the solution set $2x + 3 \le 7$, $x \in Q$

20) Find the result of $(5.4 \times 10^{4}) + (3.7 \times 10^{5})$

21) A coin is tossed twice , calculate the probability :

a) The two faces are similar.

b) Appearance only one tail.

c) Appearance at least one head.

d) Appearance at most one head.

22) Complete:

a) The s.s of the inequality $2 < x \le 4$ in N is ------------

b) $\frac{1}{1000}$, $\frac{1}{100}$, $\frac{1}{10}$, --------- , ----------

c) The additive inverse of $\sqrt{(\frac{-2}{5})^{2}}$ is ----------------

d) $\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{15}{16}$, ------- , --------

23) If a fair die is thrown once , find the probabilities of each of the following events :

S = { 1 , 2 , 3 , 4 , 5 , 6 } , n (S) = 6

b) B is the event of appearance of an even number.

B = { 2 , 4 , 6 } , P(B) = $\frac{3}{6} = \frac{1}{2}$

c) C is the event of appearance of the number 5

C = {5} , P (A) = $\frac{1}{6}$

d) D is the event of appearance of the number 7

D = { } or Ø , P (A) = $\frac{0}{6}$ = **0** (The impossible event)

24) Choose

a) The number which in the standard form is ------ (11×10^3 , 2.3×10^5 , 30.2×10^4 , 0.32×10^5)

b) If a coin is tossed 160 times , then the approximated expected number of appearance a head is --------
(60 , 78 , 90 , 159)

c) The number $\sqrt{0.09}$ is ---------- (natural number , positive integer , negative integer , rational)

d) If : $\frac{6x}{5} = -2$, then x^2 = ------- ($\frac{-25}{9}$, $\frac{5}{9}$, $\frac{25}{9}$, $\frac{25}{9}$)

---

25) A rectangle with length equals twice its width and its area $12.5\ cm^2$.Find the dimensions of the rectangle.

Let the width = x cm. Its length = 2 x cm.

Area = $12.5\ cm^2$

$L \times w = 12.5$

$2x \times x = 12.5$

$2x^2 = 12.5$

$x^2 = 6.25$

$x = 2.5$, then the width = 2.5 cm.

Its length = 5 cm.

26) If a fair die is thrown once , find the probabilities of each of the following events :

$S = \{1, 2, 3, 4, 5, 6\}$, $n(S) = 6$

e) **E is the event of appearance of a number less than 7**

$E = \{1, 2, 3, 4, 5, 6\}$, $P(C) = \frac{6}{6} = 1$

(The certain event)

f) **F is the event of appearance of an even prime.**

$F = \{2\}$, $P(F) = \frac{1}{6}$

g) **G is the event of appearance of an odd less than 4**

$G = \{1, 3\}$, $P(G) = \frac{2}{6} = \frac{1}{3}$

---

27) Simplify : $\left(\frac{7^4 \times 7^{-2}}{7^3}\right)^{-2}$

28) If $x = \frac{3}{4}$, $y = \frac{-3}{2}$, find the numerical value of $\left(\frac{x^2}{y^3}\right)^2$

29) Find the solution set $3x + 2 = 8$, $x \in Q$

30) Find the solution set $5 - 4x \geq -3$, $x \in Q$

---

31) The sum of two numbers is 15 , the difference between them is 5 , find the two numbers

Let 1st number = x , the 2nd number = 15 – x

The difference = 5

$x - (15 - x) = 5$

$x - 15 + x = 5$

$2x - 15 = 5$

$2x = 20$

$x = 10$

1st number = 10 , the 2nd number = 15 – 10 = 5

32) If $\frac{3}{4}$ of the area of a square is $1\frac{11}{64}\ m^2$, find the side length.

$\frac{3}{4} \times$ Area of a square $= 1\frac{11}{64}$

Area of a square $= 1\frac{11}{64} \div \frac{3}{4}$

Area of a square $= \frac{25}{16}$

$S^2 = \frac{25}{16}$

$\sqrt{S^2} = \sqrt{\frac{25}{16}}$, $S = \frac{5}{4}$

---

33) Complete:

a) If : $\frac{x}{y} = \frac{7}{2}$, then $\frac{2x}{7y}$ = -------

b) If : a = 0. 000625, then $\sqrt{a} = 2.5 \times 10^{\cdots\cdots}$

c) Quarter of 4^{20} is ---------

d) The s.s of the inequality $x < 3$ in N is ----------

e) The s.s of the inequality $x < 3$ in Z is ----------

f) The s.s of the inequality $x < 3$ in Q is ----------

g) If : $\frac{26}{x} + 1 = 14$, then x = ------------

h) The multiplicative inverse of $\sqrt{\frac{10}{2.5}}$ is ---------

i) If : $5x = 35$, then $2x + 1$ = ----------

j) $\sqrt{100 - (-6)^2}$ = ---------

34) Simplify with steps : $12 \times (2)^2 \div 24 + 3^2$

35) Find the solution set $3 - 4x = -5 \ , x \in Q$

36) Find the solution set $2x - 1 \geq 5 , x \in Q$

37) A bag contains an amount of marbles of the same size and softness. If 2 marbles are red, 3 marbles are blue and 5 marbles are white. A marble is drawn randomly. Calculate:

S = { 2 red , 3 blue , 5 white } , n (S) = 10

a) The probability that the drawn marble is red. P (red) $= \frac{2}{10} = \frac{1}{5}$

b) The probability that the drawn marble is blue. P (blue) $= \frac{3}{10}$

c) The probability that the drawn marble is white. P (white) $= \frac{5}{10} = \frac{1}{2}$

d) The probability that the drawn marble is not blue. P (not blue) $= \frac{2+5}{10} = \frac{7}{10}$

38) <u>Complete:</u>

a) $\frac{a^3}{b^7} \times \frac{a^5}{b^2} =$ ---------

b) If $x > 3$, then $-x$ ……. -3 (> , < , =)

c) If $x + 9 = 10$, then $7x =$ ----------

d) $(a^{-2})^3 =$ --------

e) If $a^x = 8$, $a^y = 2$, then $a^{x-y} =$ --------

f) $\sqrt{\frac{25 a^4 b^6}{16 d^{10}}} =$ ----------

g) If $a = -3$, then $a^{-2} =$ ----------

h) half of $2^{10} =$ ----------

i) $\sqrt{(3)^2 + (4)^2} = 3 +$ ------

j) If the probability of a student is succeed is $\frac{7}{10}$, then the probability of failure is ------------

k) If $x < y$ and z is a negative integer then x z --------- y z (> , < , =)

l) Some cards numbered from 1 to 10 , find the probability of a card carries a number divisible by 2

m) If the age of Ahmed now is x , then his age after 5 years is -------- , his age before 7 years is --------

39) Three natural consecutive even numbers whose sum is 966, find these numbers.

$1^{st} = x$, $2^{nd} = x + 2$, $3^{rd} = x + 4$

Sum = 966

$x + (x + 2) + (x + 4) = 966$

$3x + 6 = 966$

$3x = 960$, then $x = 320$

The numbers are 320 , 322 and 324

40) A rectangle with length equals twice its width and its perimeter = 18 cm Find the dimensions of the rectangle.

Let the Width = x cm. Its length = 2 x cm.

$18 = (2x + x) \times 2$

$18 = 3x \times 2$

$18 = 6x$ $x = 3$

The width = 3 cm and its length = 6 cm

41) <u>Complete:</u>

a) If $(0.004)^2 = 1.6 \times 10^n$, then n = --------

b) The additive inverse of $(-3)^0$ is -------

c) If the probability of a student is absent is 0.15 , and the number of the probability in this school is 600 , then the number of present student that day is ----------

d) A letter is selected from a word school , the probability of selecting the letter s is -------

42) If $x = \frac{1}{2}, y = \frac{4}{3}, z = \frac{3}{2}$ find the numerical value of $8x^3 y z^3$

43) S.S of $2x + 5 < 16$ $x \in Q$, $x \in Z$

44) Write in the standard form $(5.4 \times 10^4) + (3.7 \times 10^5)$

1) **Complete**

a) $2 \times 6 - 4 \div 2$
$= 12 - 4 \div 2$
$= 12 - 2 = 10$

b) $3x + 1 \geq 10$
$3x \geq 9$
$x \geq 3$

c) $0.0035 = 3.5 \times 10^{-3}$

d) $\frac{16}{36} = \frac{4}{9}$

e) $7 - 2x = 3$
$-2x = -4$

7) **Complete:**

a) 1

d) 13 , 21

e) P(absent) = 0.15
$\frac{\text{no. of absent}}{600} = 0.15$
no. of absent $= 0.15 \times 600$
no. of absent = 90

11) $(3x + 2) + 5 = 13$
$(3x + 2) = 8$
$3x = 6$
$x = 2$ s.s.in $Q = \{2\}$

12) $2x + 15 < 19$

$x = 2$
s.s.in $Q = \{2\}$

2) **Choose**

a) 1

b) $3a = 2b$, then $\frac{a}{b} = 2 : 3$

c) $\frac{-27}{8}$

d) $\frac{15}{36} = \frac{5}{12}$

e) $|-10|$

3) $\left(\frac{-3}{7}\right)^0 \times \left(\frac{-2}{5}\right)^2 \times \sqrt{6\frac{1}{4}}$

b) $\frac{4}{7}$

c) 0

no. of present $= 600 - 90 = 510$

8) **Choose**

a) 2^8

b) 3.2×10^5

$2x < 4$
$x < 2$
s.s in Q= $\{x : x \in Q , x < 2\}$

$= 1 \times \frac{4}{25} \times \frac{5}{2} = \frac{2}{5}$

4) $3(4)(-2) + 8(4) \div [4 \times (-2)] = -28$

5) $3x + 1 = 25$
$3x = 24$
$x = 8$ s.s.in $Q = \{8\}$

6) $2x + 5 < 16$
$2x < 11$
$x < 5.5$
s.s.in $Q = \{x : x \in Q , x < 5.5\}$

c) $\text{Area} = 9x^2$
$S^2 = 9x^2$
$s = 3x$

d) 87 %

e) $x < -4$

13) $\left(\frac{-1}{3}\right)^2 - \left(\frac{3}{7}\right)^0 + \sqrt{\frac{64}{81}}$
$\frac{1}{9} - 1 + \frac{8}{9} = 0$

14) **Complete:**

a) 1

b) $x = ½$ s.s.in $Q = \{½\}$

c) ½

d) $\left(\frac{1}{2} + \frac{1}{4}\right)^{-1} = \frac{4}{3}$

e) $n = -4$

15) **Choose :**

a) $\frac{4}{3}$

b) $x < 10$

c) 3^{x+1}

d) $\frac{360}{480} = 0.75$

e) 0

18) $\frac{5^{-4} \times 5^7}{5^3} = \frac{5^3}{5^3} = 1$

19) $2x + 3 \leq 7$
$2x \leq 4$
$x \leq 2$
s.s in Q= $\{x : x \in Q , x \leq 2\}$

20) $424000 = 4.24 \times 10^5$

21) Sample space = { HH , HT , TH , TT }

a) A = { HH , TT } , $P(A) = \frac{2}{4} = \frac{1}{2}$

b) B = { HT , TH } , $P(B) = \frac{2}{4} = \frac{1}{2}$

c) C = { HH , HT , TH } , $P(C) = \frac{3}{4}$

d) D = { HT , TH , TT } , $P(D) = \frac{3}{4}$

22) **Complete:**

a) {3 , 4 }

b) 1 , 10

c) $\frac{-4}{25}$

d) $\frac{31}{32}$, $\frac{63}{64}$

23) **Choose**

a) 2.3×10^5

b) 78

c) rational

d) $\frac{25}{9}$

a) 1

b) -2

c) 4^{19}

d) s.s in N= {2 , 1 , 0 }

e) s.s in Z= {2 , 1 , 0, -1 , ….. }

f) s.s in Q= $\{x : x \in Q , x < 3\}$

g) $\frac{26}{x} + 1 = 14$
$\frac{26}{x} = 13$, $x = 2$

h) ½

i) $x = 5$, $2 \times 5 + 1 = 11$

j) 8

34) $12 \times (2)^2 \div 24 + 3^2$
$12 \times 4 \div 24 + 9$
$48 \div 24 + 9$
$2 + 9 = 11$

35) $3 - 4x = -5$
$-4x = -5 - 3$
$-4x = -8$, $x = 2$
s.s in Q= {2}

27) $\left(\frac{7^4 \times 7^{-2}}{7^3}\right)^{-2} = \left(\frac{7^2}{7^3}\right)^{-2} =$
$(7^{-1})^{-2} = 7^2 = 49$

28) $[(\frac{3}{4})^2 \div (\frac{-3}{2})^3 \quad]^2$

29) s.s.in Q = {2}

36) $x \geq 3$
s.s in Q= $\{x : x \in Q , x \geq 3\}$

38) **Complete:**

a) $\frac{a^8}{b^9}$

b) <

c) $x = 1$, then $7 \times 1 = 7$

d) $a^{-6} =$

e) 4

f) $\left|\frac{5a^2b^3}{4d^5}\right|$

g) $(-3)^{-2} = \frac{1}{9}$

h) 2^9

i) 2

j) $\frac{3}{10}$

k) >

30) $5 - 4x \geq -3$
$-4x \geq -3 - 5$
$-4x \geq -8$
$-4x \geq -8 \div (-4)$
$x \leq 2$
s.s in Q= $\{x : x \in Q , x \leq 2\}$

33) **Complete:**

l) $\frac{5}{10} = \frac{1}{2}$

m) $x + 5$, $x - 7$

41) **Complete:**

a) $n = -5$

b) -1

c) P(absent) = 0.15
$\frac{\text{no. of absent}}{600} = 0.15$
no. of absent $= 0.15 \times 600$
no. of absent = 90
no. of present $= 600 - 90 = 510$

d) $\frac{1}{6}$

42) $8\left(\frac{1}{2}\right)^3 \left(\frac{4}{3}\right) \left(\frac{3}{2}\right)^3 = ……$

43) $2x + 5 < 16$
$x < 5.5$
s.s in Z= {5 , 4 , 3 , ….. }
s.s in Q= $\{x : x \in Q , x < 5.5\}$

44) $424000 = 4.24 \times 10^5$